

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)	ET Docket No. 03-104
Inquiry Regarding)	
Carrier Current Systems,)	
including Broadband)	
over Power Line Systems)	

Comments regarding Notice of Inquiry

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1. Personal background

I feel qualified to comment on this Notice of Inquiry, having been a licensed radio amateur for nearly 44 years (40 years as Extra Class). I hold a Bachelor's degree in Physics, and held a First Class Radiotelephone licence for nearly 20 years until it was automatically converted to General Radiotelephone and I allowed it to expire.

Relevant employment includes two years as chief engineer at an AM broadcast station, four years in the US Army Security Agency (duties included extensive monitoring of foreign military and government communications throughout the HF spectrum and reporting intelligence data to the National Security Agency in Washington, DC), and three years as head of the service department of a commercial two-way radio business (installation and repair of VHF and UHF communications systems, and repair of commercially-built HF, VHF and UHF amateur radio equipment).

2. The Commission asked: **Are the existing Part 15 rules for low speed carrier current systems adequate to protect authorized users of the spectrum who may be affected by the new high speed BPL technology? What changes to these rules, if any, are necessary to protect authorized radio services? How should the Part 15 rules be tailored both to ensure protection against harmful interference to radio services and to avoid adversely impacting the development and deployment of this nascent technology?**

I suspect that technical standards in the existing Part 15 rules, written for low speed carrier current systems, are inadequate to protect incumbent users of the proposed spectrum from 2 to 80 mHz, from harmful interference from high speed BPL technology. The fundamental underlying principle governing use of unlicensed Part 15 devices is stated in no uncertain terms: these devices must not generate harmful interference to authorized services, and users of these devices must accept whatever interference may exist from licensed stations.

Part 15 rules should not be changed to grant utility companies the blanket authority to retrofit existing electric power lines to facilitate brute-forcing them to carry broadband signals in the 2 to 80 MHz range, for which they were never designed. The Commission may grant exceptions to the present rules, in the form of STA (special temporary authorization) to allow transmissions for highly controlled experimentation with BPL technology. By “highly controlled” I mean that experimental transmissions must not interfere with authorized users of the radio spectrum for any significant period of time. Test data must be conducted with the full cooperation of potential BPL service providers as well as incumbent users of the subject spectrum, and the resulting data must be fully shared with all interested parties. No permanent changes should be made to existing Part 15 rules until all parties are fully satisfied with the accuracy and validity of the test results. If the test data shows the need, technical standards contained in the Part 15 rules must be made even more stringent than they are at present, to assure no harmful interference to incumbent users of the radio spectrum. The only acceptable changes to the rules to avoid adversely impacting the development and deployment of this nascent technology would be changes that assure no increase in interference levels in the radio spectrum beyond what already exists.

3. Is there a need to define frequency bands that must be avoided in order to protect the licensed services that use the same frequencies as In-House BPL systems? Are there specific issues of interference that we should address, e.g. an increase in the level of the noise floor? Given their different operating environment, is it necessary to tailor the rules to differentiate equipment used specifically in Access BPL and In-House BPL applications, or should one set of general limits be applied to both? Given their different operating environment, is it necessary to tailor the rules to differentiate equipment used specifically in Access BPL and In-House BPL applications, or should one set of general limits be applied to both?

It may be possible to notch out certain portions of the spectrum to accommodate specific users, for example, the amateur radio bands and/or the international shortwave bands. But since every portion of the spectrum is occupied by some authorized user, the only way to satisfy the needs of all incumbent users would be to avoid BPL technology altogether. Since many users of the radio spectrum, both HF and VHF, engage in weak signal reception, no increase whatever in the noise floor will be acceptable. The Commission need not be concerned with in-House BPL systems where the user would be the only party affected by interference. However, even one case of interference to anyone beyond the user of the BPL system would require steps to satisfactorily mitigate the interference, according to the fundamental underlying principle prescribed in the Part 15 rules for unlicensed devices. This fundamental principle of non-interference to authorized radio services is equally applicable to In-House and Access BPL.

One concern with Access BPL is the high signal levels that would be transmitted to overcome noise inherently generated by power lines in their primary function, the distribution of electricity. Broadband transmissions are bi-directional; not only would the centralized broadband service provider be required to inject significant levels of broadband signal into the power lines to allow satisfactory downloading of data by the customer, each customer would be required to inject a similar signal level into the power system to successfully upload. This is not to mention repeaters that would have to be installed every few thousand feet along the power line to

overcome signal attenuation. The result would be many thousands of broadband emitters simultaneously feeding data at significant power levels into the electrical distribution system. The resulting interference problem will likely be unsolvable, given the physical structure of the existing power distribution system that is ubiquitous across the country in both rural and urban residential and industrial areas. If electric utility companies wish to get involved in broadband data distribution, a better solution would be to install fibre optic cable. I understand that some utilities are already equipping their power lines with a type of cable that contains, in addition to strands of conductor and a steel core for mechanical support, an embedded strand of fibre optic cable that can be used for unlimited data distribution without the risk of interference from electrical noise generated by the distribution of electricity. The cost of deploying fibre optic cable should be weighed against the costs of repeaters and the components that would have to be installed to bypass distribution transformers, as well as the inconvenience to the public that interference from BPL technology would cause.

4. Should the Part 15 rules specify both radiated emission limits and conducted emission limits for BPL systems, or would one type of limits be sufficient to control interference from both low speed and high speed BPL?

Part 15 rules should specify both radiated and conducted emission limits. It is obvious that incumbent authorized users of the radio spectrum will be protected only if radiated emission is limited to such an extent that no harmful interference is generated, including any perceptible increase in the level of the noise floor. Conducted emission should be limited to the extent necessary to avoid any malfunction of electrical devices connected to the power mains. Radio and television receivers, audio and video playback equipment and computers for example, may be adversely affected by random noise on the power lines. There is also the danger that bypassing circuitry installed around distribution transformers to allow the passage of data signals, could reduce the electric customer's protection from lightning discharges and other voltage surges that might damage appliances and equipment. Bypassing circuitry would inherently render ineffective any electrostatic shielding placed by the manufacturer between the primary and secondary windings of distribution transformers.

5. Why it is necessary to protect the HF and VHF radio spectrum.

In May, 2002, the Commission proposed under Docket ET 02-98, to create a new secondary allocation for the amateur radio service between 5250 and 5400 kHz. After the expiration of the time limit for comments from the public, the National Telecommunications and Information Administration (the President's principal adviser on telecommunications and information policy) raised an objection with the Commission on the grounds that following the events of 11 September, 2001, federal agencies with homeland security responsibilities had developed renewed interest in the HF spectrum. Ultimately, a much more limited allocation of five spot frequencies was granted. If the government is seriously concerned that allocating a small 150 kHz wide sliver of spectrum in the vicinity of 5 MHz to the amateur service would pose an unacceptable threat to national security, then the risk of rendering large portions of the HF radio spectrum useless for communication due to broadband noise simultaneously radiated from electric power lines located throughout the nation would inevitably pose an infinitely greater threat.

Widespread BPL interference in the HF spectrum could hamper the U.S. government's intelligence-gathering efforts if such interference precluded monitoring foreign communications from U.S. based listening posts. Likewise, the FCC's rules enforcement efforts would be compromised if domestic monitoring stations were rendered ineffective due to BPL interference.

It could even be claimed that the presence of BPL interference on HF raises 1st Amendment issues. The international shortwave broadcast service is a significant resource of uncensored information available at minimal cost to individuals throughout the world. The use of radio receivers to listen to international broadcasts provides the means for residents of the US and other countries to hear alternative views concerning world events that may not be available through the local mainstream media. The advent of harmful BPL interference would close this important source of information that is not filtered by local or national information providers or government agencies. Widespread deployment of BPL would not only affect residents in close proximity to power lines in the U.S., but due to the laws of physics, simultaneous radiation of broadband noise from many point sources distributed over wide geographical areas would propagate by skywave and potentially disrupt HF communications worldwide. Since use of the HF spectrum is governed by international treaty, the United States could be found in violation if communication circuits in other countries are adversely affected.

6. Conclusion

It is my understanding that the government of Japan has already decided not to allow this technology to be implemented, because of the interference potential to users of the HF spectrum. Harmful interference has been reported from systems already deployed in several European countries. I believe that BPL is the wrong approach to providing broadband access. The potential to corrupt the HF spectrum, a limited international resource, is too great a price to pay. High speed internet service is increasingly being offered by the cable television industry, using non-interfering shielded conductors for delivery. Fibre optic networks and wireless services are being expanded. Broadband DSL delivery over minimally radiating balanced pairs of wire (existing telephone lines) is becoming widely available. . The Commission should support the best technical solutions rather than what one special interest group may deem the most expedient. In my opinion, BPL represents a very poor technical solution to expanding broad band access for the public. The concerns expressed by users of the radio spectrum are not "unsupported claims;" there have been widely documented and reported incidents of interference wherever BPL systems have been deployed. I respectfully urge the Commission to make no changes to Part 15 rules that could result in further degradation of the HF and VHF radio spectrum.

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